Nanostructured surfaces

Structural properties of $ZnO_{1-x}S_x$ deposited by chemical bath deposition

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$ZnO_{1-x}S_x$ alloys have attracted a special interest of researchers due to the possibility of controlled change of the band gap in a wide range from 3.37 eV (ZnO) to 3.68 eV (ZnS). This allows creating of effective UV photodetectors, electroluminescent devices, and others. The use of $ZnO_{1-x}S_x$ buffer layers instead of ZnO can increase the conversion efficiency of thin-film solar cells based on CdTe, Cu(In, Ga)Se_2 and Cu_2ZnSnS_4.

Among the various methods of obtaining of $ZnO_{1-x}S_x$ films, chemical bath deposition (CBD), due to the simplicity and efficiency, is one of the promising non-vacuum methods for deposition of layers with controlled properties [1].

Nanostructured $ZnO_{1-x}S$ films were chemically deposited onto pre-cleaned substrate with an FTO (SnO2: F) underlayer from an aqueous solution of zinc acetate ($Zn(CH_3COO)_2$), thiourea ($CS(NH2)_2$) and ammonia at a temperature of initial solution of 90 ^{0}C. Deposition time of the films ranged from 30 to 120 minutes.

Surface morphology of the samples was studied using the scanning electron microscopy. The chemical composition of the films was determined by energodispersive analysis (EDAX). Structural studies were performed on an automated X-ray diffractometr Bruker D8 Advance in Ni-filtered of K_α radiation of anode.

As a result of researches, it was found the dependence of the time of deposition on the elemental composition and structural properties of the layers of $ZnO_{1-x}S_x$ solid solutions, obtained by chemical bath deposition. It is shown that condensates have a hexagonal structure with a lattice constant, a = 0.32486 nm, c = 0.52086, c/a = 1.603, and growth texture [200], the quality of which depends on the time of the deposition and elemental composition of the condensates. As a result, it was established the parameters of deposition of $ZnO_{1-x}S_x$ film with controlled features.

1. *Opanasyuk A.S., Berestok T.O., Fochuk P.M., Bolotnikov A.E., James R.B.* Structural and sub-structural features of chemically deposited Zinc-oxide thin films // Proc. of SPIE.–2013.–**8823**. - P.88230Q-1-6.

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